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|-----------|---|---|--------|----------------------|-----------|
| 5,441,772 | A | * | 8/1995 | McAndrew et al. | 427/388.1 |
| 5,750,223 | A | * | 5/1998 | Tada et al. | 428/35.8 |

- FOREIGN PATENT DOCUMENTS

- JP 7236496 R * 9/1972 428/35.8

- * cited by examiner

- Primary Examiner*—Harold Pyon

- Assistant Examiner*—Sandra M. Nolan

- (74) *Attorney, Agent, or Firm*—Michael J. McGowan;
James M. Kasischke; Prithvi C. Lall

- (57) **ABSTRACT**

- Corrosion resistance is provided for a power cylinder by providing a preloaded molded urethane elastomer sleeve liner within an outer cylinder of material such as a copper/nickel alloy which is subject to corrosion from long-term exposure to ambient fluids such as sea water. Preloading is preferably provided by thermal shrink fitting of the molded urethane sleeve liner to the inner bore of an outer metal cylinder. Preloading of a structure which has high structural integrity and low permeability thus effectively prevents incursion of fluids and gases at the interface between the outer cylinder and the sleeve liner as well as providing a surface which can be machined to a high degree of smoothness and against which reciprocating piston seals and wear assemblies can directly ride and which is resistant to abrasion therefrom even at high piston speeds.

- 4 Claims, 1 Drawing Sheet**

- (56)
- References Cited**

U.S. PATENT DOCUMENTS

- | | | | | | |
|-----------|---|---|--------|----------|---------|
| 4,501,841 | A | * | 2/1985 | Herring | 524/411 |
| 5,348,425 | A | * | 9/1994 | Heiliger | 405/297 |
| 5,439,065 | A | * | 8/1995 | Georgi | 175/59 |

